THE POSTERO-LATERAL SCLEROSES[1].

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We report eight cases of sclerosis of the posterior and lateral columns of the spinal cord, and propose to place them as far as is possible in a classification of combined diseases of the cord. The first four are cases of degeneration of the cord associated with anemia. The history of the first, one in which the anemia was secondary to chronic parenchymatous nephritis, is as follows:

Mrs. G., 46 years old, a widow, was admitted to the Home for Incurables, 7, 26, '01. Her father and one brother had died of carcinoma, her mother and two brothers of phthisis. She had never been pregnant. She had had typhoid fever with pneumonia eight years before. Except for this illness her health had been good. Four years before her admission to the Home her legs began to be weak, and she could not walk as well in the dark as in the light. After several months of rest she improved sufficiently to return to her work. She remained in fairly good health, but always with some weakness in the legs until last year, since which time she has been growing steadily worse. She now complains of great weakness in the legs, and of a sensation of "misery" in them, but not of pain. She says that at times the legs jerk and twitch.

When she is helped to walk the gait is very ataxic. Static ataxia is also very marked. There is no muscular wasting. All the extremities are weak. There are irregularly-shaped scattered areas of anesthesia on the thighs and legs. Sensation is delayed and often doubled on the feet. The knee-jerks are absent. Sticking either side causes extension of the toes. The reflexes of the arms are normal. The urine contains a small quantity of albumin and granular casts. The blood examination showed H. 30 per cent.; R.B.C., 1,280,000. Her condition gradually grew worse. In September of 1901, the kidney trouble became acute, the anemia pernicious in type, and she died of uremia. Just before death the red blood cells numbered 980,000, and the hemoglobin estimation was 28 per cent.

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The necropsy revealed chronic parenchymatous nephritis, chronic gastric catarrh, and the usual changes in the bone marrow of the pernicious type of anemia. The brain was macroscopically normal. Slight chromatolysis of Betz's cells was present. The spinal cord showed diffuse degeneration, especially in the posterior and lateral columns in which parts it was associated with much sclerosis.

The cervical cord showed in the posterior columns dense sclerosis resembling secondary ascending degeneration. In the postero-external columns the degeneration was less marked and tended to reticular formation. The lateral columns showed dense sclerosis of the crossed pyramidal, less dense of the cerebellar tracts, and a diffuse degeneration of the antero-lateral and direct pyramidal tracts. In the anterior part of the cord there was a slight marginal sclerosis such as is frequently seen in senile cords. The glial cells around the central canal formed a mass at least twice as large as usual. The anterior horn cells examined by the Nissl method appeared normal, but there was a very large amount of yellow pigment, in some cases filling the entire cell. Examination by the Marchi method showed degeneration, with black clumps and compound granule cells in the posterior and lateral columns. There was well defined degeneration in both the anterior and posterior roots. The pigment in the anterior horn cells stained black where treated by this method.

In the dorsal region of the cord the crossed pyramidal and direct cerebellar tracts and the posterior columns, except the root zones, were densely sclerotic. The remainder of the white matter was diffusely degenerated with hollow spaces here and there. The anterior horn cells resembled those in the cervical region. The central canal was packed with and surrounded by a glial formation which also involved both commissures.

In the lumbar cord there was slight sclerosis with hollow spaces in the posterior median columns, and a few hollow spaces in the posterior external columns. There was slight sclerosis of the crossed pyramidal tracts. The remainder of the white matter showed very little change. The proliferation of glial cells around the central canal amounted to a distinct tumor formation, triangular in shape and extending backwards into the posterior columns and laterally into the gray matter of the median portion of the anterior horns.

To sum up: there was diffuse degeneration of the white matter of the cervical and dorsal areas with dense sclerosis of the postero-median columns and crossed pyramidal tracts throughout the cord; degeneration of the anterior and posterior roots, shown by the Marchi method; marked central gliosis most marked in the lumbar and least distinct in the cervical region; slight marginal sclerosis; no meningeal lesion.

We are enabled to report the second case through the courtesy of Dr. D. J. Milton Miller. The patient, J. L., a woman, sixty years old, complained for two years of numbness and tingling in the hands and forearms especially after they had been in hot or cold water. There was nothing of importance in the family or previous personal history. The clinical course of the disease while the patient was in the hospital was that of pernicious anemia. On admission the blood examination showed 27 per cent. of hemoglobin and 1,000,000 red corpuscles. A short time before death the hemoglobin had increased to 47 per cent. and the red corpuscles to 1,800,000. The reader is referred to Dr. Miller's paper for details of the clinical history. The only nervous symptoms were shooting pains in the legs, a well defined girdle feeling, numbness in the arms and legs, loss of power and impaired sensibility in the right arm and hand, delayed sensation in the legs and the absence of all the reflexes in the legs.

The patient died on January 3, 1902. Examination of the brain revealed only a slight diffuse chromatolysis of the large ganglion cells of the cortex. In the spinal cord sclerosis was well marked in the crossed pryamidal and direct cerebellar tracts, less marked in the antero-lateral and Gowers' tracts. Slight areas of degeneration existed in the direct pyramidal tract and anterior ground bundle. The median portion of each posterior column showed dense sclerosis. The remainder of the posterior columns showed a diffuse sclerosis with a large number of myelinated fibers intact. These fibers were arranged crosswise, some running transversely, others in whorls.

In the dorsal cord the degeneration and sclerosis affected the entire posterior columns except the root zones. A diffuse sclerosis affected the lateral tracts and a number of hollow areas were scattered throughout the rest of the white matter. In the lumbar enlargement the degeneration was confined to the crossed pyramidal tracts, the posterior columns, and indeed all the rest of the cord was normal. The nerve cells throughout the cord contained large quantities of yellow pigment. The vessels of the white and gray matter showed marked hyaline degeneration, the walls being thickened and staining very diffusely. The roots reacted normally to all methods of staining except the Marchi. By it distinct degeneration was shown in the posterior, and questionable degeneration in the anterior roots. In the cord the sclerotic and degenerated areas contained a large number of black dots and compound granule cells.

To sum up: there was in the cervical and dorsal cord diffuse degeneration throughout the entire white matter, with dense sclerosis in the posterior and lateral columns; in the lumbar cord degeneration with sclerosis confined to the lateral columns; hyaline change in the blood vessels, and degeneration of the roots by the Marchi method. (See Fig. 1.)

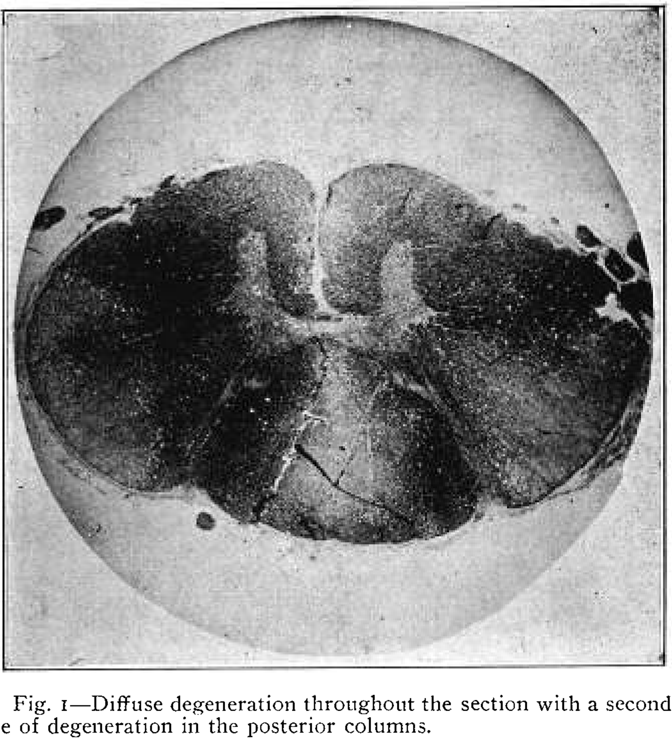

Fig. 1—Diffuse degeneration throughout the section with a secondary type of degeneration in the posterior columns.

The history of the third case, a typical example of pernicious anemia, is as follows: The patient, an insurance agent, fifty-six years old, was admitted to Dr. Morris J. Lewis' ward at the Infirmary for Nervous Diseases, complaining of weakness, and with manifest anemia. The family and personal history revealed nothing of importance. He admitted having had gonorrhea, but denied syphilis, and showed no signs of it. The illness for which he came to the hospital had begun two years before. The first symptom of which he complained was sore mouth and ulceration of the gums. This had lasted many months, but finally healed. In the meanwhile he had been gradually losing strength and he noticed numbness in the hands and feet. More recently pain in the dorsal and cervical spine appeared, and he began to have shortness of breath.

Examination revealed a sallow, poorly-nourished man. There was a little numbness in the arms and legs, but no true anesthesia. The ulnar and musculo-spiral nerves were tender to touch. There was great muscular weakness, but no true palsy. The urine contained neither albumin, sugar, nor casts.

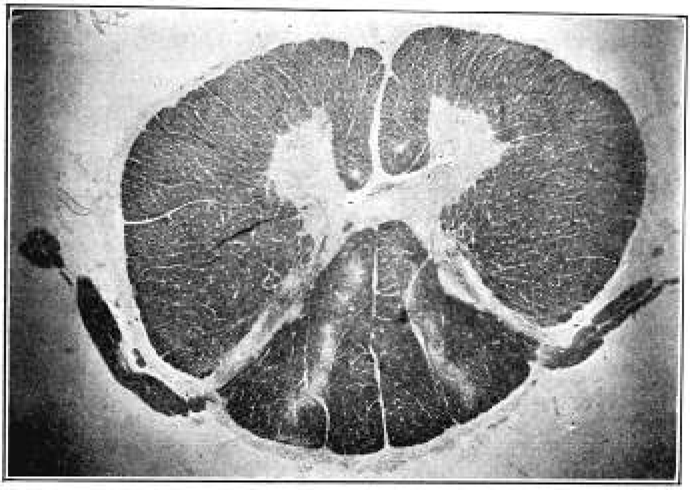

Fig. 2—Photograph showing diffuse degeneration in the posterior columns. This was present in only a small portion of the cord.

The lowest blood count showed hemoglobin 15 per cent.; red corpuscles 532,000; white corpuscles 1,500.

He died on November 23, 1901. The necropsy revealed the changes common in pernicious anemia: orange-colored, subcutaneous fat, red marrow in the long bones, atrophy of the gastric mucosa, etc.

The spinal cord changes consisted in a U-shaped area of degeneration in the posterior columns, each leg of the U being situated in the postero-external column and extending close to the margin of the cord. (See Fig. 2.) This area of degeneration extended from the fifth cervical to the second dorsal segment. There was very little sclerosis, the degenerated area consisting of a reticular tissue, with degenerated myelin, and, as shown by the Marchi method, fat globules and compound granule cells along the vessels. The vessel walls and ganglion cells were normal.

The fourth case is that of an English woman, thirty-four years old, who was admitted to the Philadelphia Hospital, January 30, 1901, complaining of loss of power in the legs. She had used alcohol moderately and tea to excess. Neither her history nor physical examination revealed any evidence of syphilis. A year before admission she began to have creeping feelings, and later distinct lancinating pains in the legs. A few months later she began to lose power in the legs, which increased until finally she was chair-ridden. The bladder and rectum were not affected at any time.

Examination. She was a thin, undersized, weak-looking, pale woman. There was marked loss of power in the legs. She was not able to stand up, indeed she could not lift either leg entirely off the bed. She could flex and extend the knee while the weight of the leg was supported by the heel upon the bed, could move the thigh weakly in any direction, and could flex and extend the ankles and toes. There was not only palsy, but also ataxia in the movements of the legs. The arms were weak but neither paralytic nor ataxic. There was no local muscular wasting, but marked general emaciation. Sensibility to touch and temperature was normal, but on the legs there was some impairment of sensibility to pain. The heart and lungs were normal. The urine contained neither albumin, sugar nor casts. The leg reflexes were absent. The first examination of the blood showed red corpuscles 894,000, white corpuscles 10,000, and 40 per cent. of hemoglobin. A second examination six weeks later showed red corpuscles 2,780,000; white corpuscles 8,000, and 43 per cent of hemoglobin. The further notes of the case are lost but we can with certainty of correctness state that under treatment with Blaud's pill, Fowler's solution, rest in bed, and feeding she improved so much that she put on weight, improved greatly in color, and walked without any difficulty. The red corpuscle count and percentage of hemoglobin rose quite high, but we cannot give the figures. She was discharged at her own request "feeling very well." The remaining cases were due to causes other than anemia.

Case five, J. P. G., fifty-nine years old, machinist, was admitted to the Philadelphia Hospital, April 24, 1901. He had used alcohol to excess for a long time, and had a chancre when 47 years old. About three years before admission his legs began to feel tired, heavy, and weak, and at the same time or soon after the stiffness, which made it difficult for him to rise, came on. One morning in August of 1900 he awoke and found his legs anesthetic from the hips down and so stiff that he could not move them. The next day he was able "to hobble around," and in a few days sensibility partially returned. There was for a time a distinct girdle sensation. For a few days before admission he had some urgency of micturition.

Examination. He was a man of spare build, but showed no local muscular wasting; indeed on account of the constant spasm the legs were proportionately better developed than the arms. Gait was very spastic. There was some true loss of power in the legs, none in the arms. He could not stand with the eyes closed. All the normal reflexes in the legs were exaggerated. The Babinski reflex was present on both sides. Ankle-clonus and rectus-clonus were marked. Rigidity of the legs from spasm was very marked. There was anesthesia to touch in irregularly scattered areas over the trunk and extremities, but sensibility to pain and temperature was normal. There was no ataxia in the arms. There was no nystagmus. Speech was normal. The urine continuously contained albumin and casts. He died of Bright's disease on June 1, 1901.

The spinal cord presented the following condition: There was degeneration which in the cervical region was differently placed in the upper and lower parts. The second and third cervical segments presented by the Weigert method very marked degeneration in the entire postero-median columns, and quite marked degeneration in the middle part of the postero-external columns. In the fifth, sixth and seventh cervical segments the disease continued distinct in the postero-median columns, but was much less noticeable in the postero-external columns, and also affected the direct and crossed pyramidal and direct cerebellar tracts. At these levels also there was some diffuse degeneration with a tendency to reticular formation throughout the entire white matter. Secondary degeneration had taken place, to any degree, however, only in the posterior and crossed pyramidal tracts. Both in the posterior and lateral and to a marked degree in the direct pyramidal tracts the rapid degeneration had led to a cribriform appearance of the tissue. In the dorsal cord the degeneration was of the same character as that of the cervical swelling, except that in the lateral and antero-lateral columns the diffuse degeneration was less distinct outside the direct and crossed pyramidal and direct cerebellar tracts. In the lumbar cord the degeneration in the posterior columns was confined to a triangular patch in each postero-median column, the bases of the triangles being parallel to each other along the posterior fissure. (See Fig. 3.)

The blood vessels of the pia and of the cord outside of the sclerotic areas were normal; within them there was slight thickening of the vessel walls and a webbed appearance along the course of the vessels, due probably to the presence of compound granule cells. The cells of the anterior horns were pigmented, but otherwise reacted normally to the Nissl stain. The Marchi method revealed a few compound granule cells, stained black along the course of the vessels in the sclerosed areas. The anterior and to a greater degree the posterior roots contained many black granules.

Case six, R. J. P., a sailor, sixty-nine years old, was admitted to the Philadelphia Home for Incurables, February 1, 1901. Four years before admission his legs began to feel tired and weak and stiff, and slowly grew worse, until finally he could scarcely walk and could stand only by balancing himself against the wall. Sexual power disappeared two years before admission and about the same time he became deaf in the right ear.

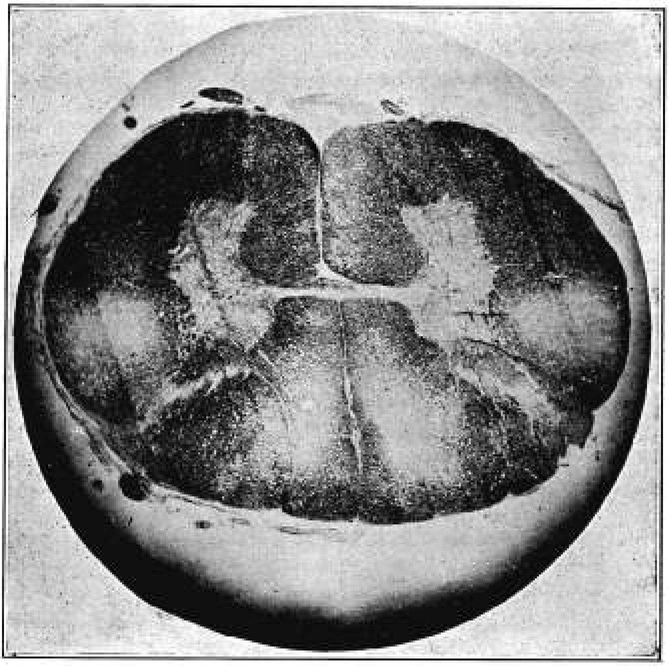

Fig. 3—Photograph showing a very diffuse type of degeneration with well marked reticular formation.

Examination. He was a well-built man with pigmented sores scattered over the trunk and extremities. There was no muscular atrophy. He had considerable difficulty in talking, his speech being a peculiar stammer with a decided tendency to scanning. [He said he had always had a slight impediment in speech, "but nothing compared to what it is now."] Static and motor ataxia was marked in the legs. Both legs were also spastic and weak. The knee, Achilles and cremasteric reflexes were exaggerated. The Babinski reflex was present on both sides. The biceps and triceps jerks were absent on the left side and very marked on the right. The right pupil, irregular in shape, reacted sluggishly to light, but with accommodation well. The irregular left pupil was rigidly fixed. There was anesthesia to all stimuli on both legs up to the knee and on the left thigh in a small area. The individual eye movements were good, but there was decided lateral nystagmus. There was a well-marked coarse intention tremor of the hands and head. Mental power degenerated during his stay in the Home, the tremor increased, speech became typically scanning; on January 22, 1902 he had a general convulsion with unconsciousness and he died three days later. The urine contained small quantities of albumin and granular casts.

Necropsy revealed the following: The convolutions over the anterior half of the brain were wasted, the pia adherent and somewhat thickened. There was much edema over the posterior part of the brain. The dura was normal. To the naked eye the spinal cord showed no lesion. When the brain was opened, after having been in a ten per cent. solution of formalin for twenty-four hours, more than a medium grade of internal hydrocephalus was present. The aqueduct of Sylvius and the fourth ventricle were also distended. The ependyma of the second and third ventricles was thickened, rough and easily separated as a leathery membrane from the subependymal tissue. The ependyma of the fourth ventricle was granular.

Microscopic examination: The cerebral cortex was somewhat atrophied. The cortical cells appeared normal in structure when treated by the ordinary nuclear stains. There was a low grade, productive meningitis of the pia-arachnoid. The vessels of the pia showed a well-defined endarteritis. The tangential fibers were at the best few and in some areas entirely absent. The ependyma was irregularly proliferated, there being heaps of cells in some places instead of a single row. Beneath the altered ependyma the glia was densely thickened and in it lay a plexus of vessels around which were several layers of small, round nucleated cells. As the thickened glia shaded off into the normal reticulum the vessels still retained their sheath of one or two rows of nuclei. The same condition existed in the lining of the fourth ventricle. Examination of the basal ganglia, the pons and medulla gave findings similar to those in the subependymal tissues of the cerebrum. There was a very marked gliosis beneath the ependyma of the fourth ventricle, and the ependymal cells there showed very marked proliferation, whirls of cells in some areas projecting into the lumen of the ventricle. Endarteritis and periarteritis were present in the pons and in less degree in the medulla. The pia-arachnoid of the medulla contained accumulations of small round cells here and there, but there was not the marked productive meningitis seen in the cortex. The nuclear ganglion cells of the twelfth and nucleus ambiguus were the seat of a diffuse chromatolysis. The pyramids were normal.

The meninges of the cord were normal. A slight degeneration shown by dropped out nerve fibers here and there was present in the lateral tracts and postero-median columns. A slight but distinct sclerosis was shown by the glial stains in these areas. The remainder of the cord was normal. The root zones in the dorsal and lumbar areas remained intact. The degeneration of the lateral columns in the lumbar enlargement was confined to the crossed pyramidal tracts. The nerve roots were not degenerated. The vessels of the cord itself showed no changes except that the media of the anterior spinal artery was perhaps a trifle thickened but not enough to have attracted attention had the cerebral vessels been normal.

Case seven, J. A., a laborer, fifty-five years old, was admitted to the Philadelphia Hospital, September 24, 1900. He had had syphilis some years before. He could not say how long he had been ill nor how his trouble began. He had been under the care of one of us (C.W.B.) three years before admission, and at that time had pain in the legs and back, a spastic and ataxic gait, increased reflexes in the legs, ankle-clonus, slight spasmodic retention of urine, no muscular wasting and normal pupillary reflexes.

Examination. There were weakness and spastic rigidity in both legs, more marked in the left. He could walk only by pushing a chair in front of him. There was some weakness of the left arm and left side of the face. He could not stand alone on account of both spasm and ataxia. There was some tremor of the tongue and slight ptosis of the left eyelid. He had some spasmodic retention of urine. Speech was slow but distinct. The normal reflexes of the legs were all much increased. The Babinski reflex was present. Ankle-clonus could not be obtained, probably because of the extreme spastic rigidity. The arm reflexes were absent. The pupillary reflexes were normal. He died on March 30, 1901.

The spinal cord lesions were as follows: The cervical cord stained by hematoxylin and by the Weigert method showed a diffuse sclerosis very dense in the posterior and lateral columns, and also a narrow band around the periphery and following the blood vessels inward. The nuclear stains showed a well developed productive meningitis. There was marked endarteritis of the vessels of the cord. The media were especially thickened. In short there was a specific meningomyelitis. Both the anterior and posterior roots were degenerated. The anterior horn cells were normal by the nuclear, carmine and Nissl stains. There was an ascending degeneration in the postero-median columns, and annular degeneration in the postero-external columns.

In the dorsal cord the degeneration was more marked than in either the cervical or lumbar. The posterior columns were affected in their entire area except in the root zones. The lateral tracts were also densely sclerosed, with the annular area of sclerosis in the antero-lateral and direct pyramidal tracts noted in the cervical region. The meningitis was more marked here than anywhere else in the cord.

In the lumbar cord the degeneration in the posterior columns was very slight and affected only the periphery. The roots were slightly degenerated. Besides the annular degeneration, there was also in the lateral column a wedge-shape area of degeneration of the crossed pyramidal tract, following the type of a descending degeneration from the dorsal lesion. The anterior horn cells were normal, but contained large quantities of the yellow pigment so commonly seen in these cells.

Case eight, J. J. M., a man fifty-three years old, was admitted to the Philadelphia Hospital, May 31, 1900. His memory was so poor and his answers were so contradictory that we could learn nothing about the history of his illness.

Examination. He was well nourished. The facial expression was dull, but except the poor memory he showed no other psychic symptoms than those common in stupid men. There was no muscular atrophy. The muscle power was weak. The knee-jerks were exaggerated, but ankle-clonus could not be obtained, probably because of the spastic condition of the muscles. The Babinski reflex was present on both sides. Sensibility especially for temperature was diminished on the legs. There was considerable ataxia and in the arm movements like a very coarse intention tremor. He had marked static ataxia and could not walk unaided. The symptoms remained unchanged until the death of the patient from cardiac failure and edema of the lungs on July 4, 1900.

The brain exhibited no gross changes. In the cervical enlargement sections treated by the Weigert sheath stain revealed a dense sclerosis affecting the entire posterior columns, the crossed pyramidal and the direct cerebellar tracts. The remainder of the cord was entirely normal. The degeneration in the posterior columns could be followed to the lower dorsal region where it gradually disappeared, growing less section by section. The degeneration in the crossed pyramidal tract was equally well marked throughout the entire length of the cord down to the lower lumbar region. The direct cerebellar tract was likewise degenerated throughout its whole course. In the posterior columns the root zone was much degenerated. In the postero-median column it was hard to find a trace of myelin, so dense was the sclerosis. The same was true of the greater portion of the postero-external column, although a few scattered myelinated fibers were seen near the gray matter. The sclerosis in the crossed pyramidal tract was almost as dense as that in the posterior columns. There were more stained fibers in the direct cerebellar tract than in either of the other two. The spinal roots showed no degeneration.

The Marchi method revealed very few degenerated fibers, but there were along the course of the vessels and more markedly in the lateral than in the posterior columns numerous compound granule cells which stained black. The roots, treated by this method, showed no degeneration. The degeneration could not be followed above the medulla; in the posterior columns it extended up to their nuclei; in the lateral tracts to the decussation. The cells of the anterior horns contained much yellow pigment, but were otherwise normal. The meninges showed an increased number of nuclei, but a distinct meningitis could not be said to exist. The vessels of the meninges and of the cord showed everywhere slight, and in the sclerosed areas marked, thickening of the media.

To sum up we had in this case a system degeneration affecting the crossed pyramidal tracts, the direct cerebellar tracts, and the posterior columns throughout their entire course, the nerve roots and the remainder of the cord reacting normally to all the different staining methods except that of Nissl.

Remarks: There are in the collection described above five cases of diffuse degeneration affecting the posterior and lateral columns, in four of which there was an associated intense anemia. In only one was the anemia pernicious in type, in another it was associated with senility, and in a third with parenchymatous nephritis. The histological changes in this group do not differ from those already described by Minnich, Nonne, Dana, Putnam, Burr and in the later contribution of Putnam and Taylor.

In cases one and six there was marked central gliosis. In case one, associated with anemia secondary to parenchymatous nephritis, the gliosis increased downward from the cervical region until in the lumbar cord it constituted a distinct tumor formation destroying the posterior commissure and explaining the loss of the pain sense. Subjective disturbances of sensation are common in the early stages of this group, and loss or impairment of the pain sense is more frequent than interference with the other forms of sensibility. The only constant lesion of the gray matter in this group, if indeed it be in truth a lesion, was intense pigmentation of the cells in the anterior horns. No distinct isolated hemorrhages were seen in any of the sections. We see nothing in these cases against accepting the intoxication theory to explain the diffuse degeneration and much in its favor. In the two cases in which nephritis and uremia were present this theory seems more rational than any other. The vessel changes were such as can be explained by the involvement of the vessel walls in the sclerotic process. There was, however, in the case of senile anemia a diffuse hyaline change independent of the sclerotic areas, and in the lumbar enlargement where the sclerosis was least, the degeneration of the vessel walls was as marked as in the most sclerotic parts of the cord. We do not attribute any special importance to the degeneration of the roots, seen only in the Marchi preparations, and do not consider it intense enough to explain the pains and disappearance of the reflexes. Though we have included these cases under the general title of postero-lateral scleroses, the process was not confined strictly to those tracts. The subacute degeneration affected in all our cases the lateral and anterior portions of the cord, but the secondary sclerotic process in the posterior and lateral columns was most intense in these areas, and the clinical phenomena are referable to them.

The two cases of syphilis of the nervous system illustrate two different types of disease due to the same cause. One (case seven) presented the lesions of a meningo-myelitis and a dense sclerosis of the posterior and lateral columns. Throughout the rest of the cord a slight perivascular sclerosis was present. There was also a ring of marginal sclerosis. The clinical picture differed but slightly from that of the long-standing cases of subacute degeneration.

The other (case six) is, to us, the most interesting of those here reported. In 1900 we reported to this Association[1] a case that showed at different periods the clinical picture of tabes, non-syphilitic postero-lateral sclerosis, and spastic paraplegia, and at necropsy presented the lesions of multiple sclerosis. We refer to that case here, and have included it in the series, in order to contrast it with case six which in life gave as typical a clinical picture of disseminated sclerosis as we have ever seen, and post-mortem an equally typical histologic picture of cerebro-spinal syphilis. The degeneration of the spinal cord was strictly confined to the posterior and lateral columns, without meningeal lesions and with such slight changes in the vessels that they can be disregarded in explaining the degeneration. There was also a very slight diffuse sclerosis of the posterior and lateral columns, following a system type, with sufficient defect in the myelin to give clear pictures to the naked eye after treatment by the sheath stains. This intrinsic degeneration of the cord and the lesions of the ependymal and subependymal tissues point to some intoxicating agent, as the lesions were identical with those described by us in a case of acute internal hydrocephalus for which no cause was found.[2] In investigating it we carried out a series of experiments on lower animals to study the effects of toxic materials placed within the ventricles. The reaction of the ependyma and underlying tissues in the intoxication experiments were strikingly like those in case six, and in the case of internal hydrocephalus. Tuberculin, sterilized urine, diphtheria toxin, dilute hydrochloric acid, and dilute carbolic acid all gave practically the same results, varying only in degree. The spinal cords of the animals were not studied.

Though the differential diagnosis between multiple sclerosis and multiple disseminated syphilis of the nervous system has been discussed by Gowers, Sachs and many others, this case and those reported by v. Bechterew and Krewer[3] lead us to agree with Oppenheim that a differential diagnosis must sometimes remain doubtful. Krewer's case showed at first a clinical picture of syphilis which later was replaced by a typical clinical picture of multiple sclerosis. There was no necropsy in it. In von Bechterew's case, as quoted by Krewer, the lesions resembled very closely those found in our case. There was, however, no hydrocephalus. That multiple sclerosis may present the clinical picture of a postero-lateral sclerosis is shown by the case reported by us.

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[1] JOURNAL OF NERVOUS AND MENTAL DISEASE, Dec., 1900.
[2] Journal of Experimental Medicine, Oct., 1900.
[3] Zeitschrift f. klin. Med., 1899.

The subject of combined system disease has been so thoroughly thrashed out without reaching any positive conclusion, that we shall not discuss the subject further than to state that case eight belongs to a group in which the degeneration is localized in certain fiber systems of the cord, usually the posterior columns, and the crossed pyramidal and direct cerebellar tracts. By the term combined system disease we do not mean to imply that the entire neurone to which the fiber belongs is affected, but only the portion in the cord damaged by the causative agent. We would differentiate this group from the subacute or diffuse degeneration group by the distinct limitation of the pathological process to the tracts above mentioned. We recognize fully that sometimes, when a local focus of softening has occurred, such as the area in the posterior columns in case three, should the patient live long enough a secondary degeneration might occur, and in so far the lesion be systemic. We think that such was the case in case one in which the patient so far recovered as to resume work and in which the degeneration and sclerosis in the posterior median columns were very dense, resembling to that extent sections from a case of dorso-lumbar tabes.

This small group of cases illustrates how difficult it is to arrange a classification of the diseases of the white matter in which the posterior and lateral columns are affected alone, or associated with minor changes in the other tracts, which with our present knowledge of the anatomy and physiology of the cord can be of no diagnostic value. For clinical and laboratory purposes we may arrange such cases as follows:

1. Friedreich's ataxia.

2. Tabes with associated diffuse sclerosis extending into the lateral columns. To this group may be added those cases of tabes associated with paretic dementia with secondary lesions in the crossed pyramidal tracts.

3. Tabes with degeneration in the crossed pyramidal and

also in the direct cerebellar tracts, with or without degeneration in Clarke's column.

4. Posterior sclerosis with sclerosis of the lateral columns and disease of the anterior horns. (Chronic poliomyelitis.)

5. Primary lateral sclerosis with minor changes in the posterior columns.

6. Subacute diffuse degeneration of the spinal cord due to anemia, cachexias, sepsis, *etc.*, with sclerosis in the posterior and lateral tracts predominating both in clinical manifestation and under the microscope.

7. Diffuse interstitial sclerosis, seen occasionally in chronic alcoholism with multiple neuritis,[4] in which the parenchymatous degeneration is secondary to the overgrowth of glial and connective tissue elements. To this same group on account of the similarity of the pathological process may be added the syphilitic postero-lateral scleroses secondary to meningeal lesions.

8. A combined system disease of unknown origin affecting the posterior and lateral columns, and distinctly confined to the direct and crossed pyramidal tracts and the posterior columns; the direct cerebellar tract may also be involved.

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[4] Phil. Med. Journal, Nov. 2, 1901.